

The Impact of Digital Financial Inclusion on Insurance Penetration

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Abstract

The study aims to examine the impact of digital financial inclusion on insurance penetration. The rapid evolution of global financial services, particularly in mobile-based transactions, provides the backdrop for this comprehensive analysis. Using a sample of 120 countries over the period 2011–2021, the study employs a panel fixed-effects model to assess the relationships. Insurance penetration is measured as the ratio of total premiums underwritten in a given year to gross domestic product. Digital financial inclusion is captured through indicators of both access and usage of digital financial services. Access is proxied by mobile connections per 100 people, while usage is represented by variables such as mobile money accounts, internet-based payments, mobile utility payments, and receipt of salaries via mobile phones. The empirical results reveal that the percentage of adults with mobile accounts and those using the internet for digital payments are significant drivers of higher insurance penetration. These findings underscore the transformative impact of digital financial services on expanding insurance markets, carrying significant policy implications for promoting financial inclusion and enhancing the global insurance ecosystem.

Keywords: *Digital Financial Inclusion, Insurance Penetration, Mobile Money, Digital Payment, Utility Payment*

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Introduction

Financial inclusion (FI) is a highly relevant concept for policymakers and researchers to consider. By enabling improved access to formal financial services, individuals and organizations, particularly those in lower socio-economic strata, can play a more meaningful role in the broader economy. According to the World Bank (2014), FI refers to the proportion of households and companies that use financial services. The International Monetary Fund (IMF) defines it as the use and access to financial services at an affordable price for the most vulnerable segments of society. The contribution of information and communication technologies to FI has given birth to what has been called digital financial inclusion (DFI), an extension of FI where all financial operations are performed in a cashless mode (Banna & Alam, 2020). The literature defines DFI as the digital access to formal financial services by a sector of the vulnerable population that traditionally remained excluded (Ann & Javier, 2018).

Gabor and Brooks (2017) stressed that the expansion of mobile technologies in developing countries offers the technological infrastructure to reach the unbanked, increasing the opportunities for democratizing financial services and accelerating FI. This process is widely regarded as a key pillar in the sustainable development agenda, enabling individuals not only to access financial services but also to experience the resultant social inclusion and poverty alleviation. The use of digital financial services has revolutionized access to financial services for millions of previously excluded customers. This technology has enabled individuals in over 80 countries to transition from predominantly cash-based transactions to formal financial services such as payments, transfers, savings, credit, insurance, and securities through the use of their mobile phones or other digital tools. The market is rapidly growing with the introduction of new developments in the future. Thus, digital financial services should be tailored to meet the individual needs of customers and be provided responsibly, both affordable to the customer and cost-sustainable for the provider (Chen, Yang, & Li, 2022).

The insurance industry is an essential component of the modern economy due to the fact that the risks faced by individuals, businesses, and other organizations have become increasingly complex. By providing compensation and security against potential losses, insurance policies have enabled individuals and companies to manage their individual and collective risks. The practice of insurance has allowed individuals and businesses to concentrate more of their resources on productive endeavours, and it has also provided opportunities for the mobilization of savings and investment activities. This, in turn, has played a crucial role in a country's economic development.

Insurance penetration is defined as the ratio of total insurance premiums underwritten in a given year to a country's Gross Domestic Product (GDP), and it reflects the relative importance of the insurance sector in the overall economy (Outreville, 1996; Beck & Webb, 2003). Measuring insurers' performance has become increasingly important in corporate finance literature. The insurance penetration rate serves as a key indicator of a country's insurance sector development. Similarly, life insurance penetration represents life insurance premiums as a percentage of GDP. Choudhari and Verma (2013) emphasized that while financial inclusion has traditionally focused on banking services, there is a growing shift toward integrating the poor and vulnerable groups into the insurance sector. Access to safe, easy, and affordable financial services remains largely centred around banking, but true financial inclusion will remain incomplete until the insurance needs of individuals, particularly those in rural and semi-urban areas, are adequately addressed.

Prior studies have examined several themes in financial inclusion research such as: promoting development through financial inclusion (Sarma & Pais, 2011), the effect of financial

inclusion on financial stability (Hannig & Jansen, 2010; Cull et al, 2012); the correlation between financial inclusion and economic growth (Mohan, 2006; Kim et al, 2018); country-specific financial inclusion practices (Fungáčová & Weill, 2015), achieving financial inclusion through microfinancing and financial institutions (Marshall, 2004), and the role of financial innovation and technology in promoting financial inclusion (Donovan, 2012). Later, several studies have examined digital financial inclusion with different issues, for example, the impacts of digital financial inclusion on economic growth and environmental sustainability (Ozturk & Ullah, 2022), the impact of digital financial inclusion on CO2 emissions (Wang et al., 2022), the impact of digital financial inclusion on the growth of farmers' income (Li & Wang, 2022), the impact of digital financial inclusion on the total factor productivity of listed companies (Chen, Yang & Li, 2022). When reviewing research on financial inclusion and insurance, only a limited number of studies have been documented. For example, the role of the insurance business in financial inclusion (Ehiogu, 2022); financial market inclusion, and the demand for life insurance (Luciano, Rossi, & Sansone, 2015); deposit insurance scheme of Islamic banks and financial system confidence, the financial regulator through interaction with the long-term insurance industry and financial stability (Heydenrych & Luiz, 2018).

Financial inclusion is primarily built on providing access to financial services. Therefore, there is a clear need to explore how financial inclusion affects the performance of financial service providers. Numerous studies have examined the impact of financial inclusion on banks (Ann & Javier, 2018; Ahamed & Mallick, 2016). However, financial inclusion means not only having a bank account but also having insurance products and securing unforeseen future risks, etc. (Anusha & Rakesh, 2020). Thus, the problem of the study is to examine the impact of financial inclusion on insurance penetration. Thus, this study makes several contributions to the existing literature. First, this study is the first to examine the impact of financial inclusion on insurance penetration, as compared to the existing literature. Second, it provides comprehensive data covering 120 countries and spanning the period from 2011 to 2021. The remainder of the paper proceeds as follows: Section 2 presents the Literature review and hypothesis development, followed by Section 3, which outlines the methodology. Section 4 then discusses the data analysis and results, and finally, Section 5 concludes.

Literature Review

Empirical Studies on Financial Inclusion

Financial inclusion (FI) is currently a major concern for several key international economic regulators. According to the World Bank (2014), FI refers to the proportion of households and companies that use financial services. The International Monetary Fund (IMF) defines it as the use and access to financial services at an affordable price for the most vulnerable segments of society (Sahay et al., 2015). From an academic perspective, FI is a situation where no one is denied access to basic financial services for reasons of efficiency (Mialou et al., 2017). Hannig and Jansen (2010) conclude that the primary goal pursued by FI is to provide the unbanked with the opportunity to access the financial system.

Sarma and Pais (2018) identified income level, economic inequality, literacy rate, urbanisation, and physical infrastructure as key drivers for greater financial inclusion. Interestingly, the authors note that the health of the banking sector does not have a clear effect on financial inclusion, but the ownership pattern does appear to have an influence. The research conducted by Sarma and Pais (2018) provides valuable insights into the significance of financial inclusion in the development process. It also provides a basis for identifying and

monitoring variables such as income levels and physical infrastructure, thereby fostering greater financial inclusion in countries and regions.

Cull, Demirgüç-Kunt, and Lyman (2012) examined the macro-level connections between financial inclusion and financial stability, as well as the implications of financial exclusion. It is suggested that financial inclusion can lead to improved efficiency of financial intermediation due to increased domestic savings and consequently result in greater stability. Furthermore, higher levels of financial inclusion could help reduce inequality and lead to greater social and political stability, thereby enhancing the overall financial stability of the system. Thus, it is reasonable to infer that financial inclusion can be viewed as a crucial precondition for the stability of a financial system. Mohan (2006) found that as the poverty levels decline and households experience increased levels of discretionary income, they become first-time financial savers that require easy accessibility to formal financial institutions to cultivate healthy banking habits. Subsequently, banks need to innovate and devise new methods that enable these customers to become part of their network. In addition to traditional banking routes, the micro-credit and Self-Help Group movements are steadily gaining traction. For banks to expand their reach and contribute to financial inclusion, they must innovate and develop business facilitators and correspondents. Such a model would ensure households have a convenient and accessible banking service at their doorstep. Kim, Yu, and Hassan (2020) found that financial inclusion has a positive effect on economic growth in OIC countries. Fungáčová and Weill (2020) found that China has a high level of financial inclusion, with a greater use of formal accounts and formal savings compared to other BRICS nations. The study by Agbenyo, Jiang, and Antony (2017) emphasised the significance of financial inclusion in promoting the growth of Ghana's agricultural sector. The results of the analysis indicated an inverse but significant connection between domestic credit and the private sector, which served as a proxy for the usage of financial services and agricultural growth. Additionally, a significant positive relationship was identified between lending interest rate, a proxy for the accessibility of financial services to the farmers, and agricultural growth. It is apparent that the provision of financial services alone does not lead to financial inclusion for rural farmers, and it is therefore necessary to adopt mechanisms that enable easy access to capital for expansion.

Liu et al. (2022) analyzed the link between financial inclusion and China's transition to a green economy using state-level data (2008–2020). The study found that financial inclusion enhances green economic performance by enforcing stricter credit policies on carbon-emitting firms, influencing financial development strategies and state-business relationships. M, Sun, and Sohail (2019) explored the impact of financial inclusion on renewable energy consumption and CO₂ emissions in China using the ARDL model. Their findings suggest that increased access to ATMs and insurance promotes renewable energy use while reducing CO₂ emissions, indicating an indirect role of financial inclusion in environmental quality. Ann and Javier (2018) examined banking concentration, competition, and financial inclusion across 83 countries. They concluded that higher banking concentration improves financial inclusion by expanding access to credit, savings accounts, and market competition.

Empirical Studies on Digital Financial Inclusion

Digital access to financial services has shown a high potential as an accelerator of the process of FI (Liu et al., 2022; Kolapo, 2023). Digital finance can grant individuals access to payments, savings, and credit facilities at an affordable cost via the Internet, without the need to visit a bank branch (Ozili, 2018). There is empirical evidence of the positive role that technology plays in promoting access to the financial system for the most vulnerable groups of the population (Claessens, 2006). Aziz and Naima (2021) state that financial inclusion is

facilitated through digital banking. In this sense, the contribution of information communication technologies to FI has given birth to what has been called digital financial inclusion (DFI), an extension of FI where all financial operations are performed in a cashless mode (Banna & Alam, 2020). The literature defines DFI as digital access to formal financial services by a sector of vulnerable populations that have traditionally been excluded (Chen et al., 2022; Liu & Ju, 2025). Gabor and Brooks (2017) stressed that the expansion of mobile technologies in developing countries offers the technological infrastructure to reach the unbanked, increasing the opportunities for democratising financial services and accelerating FI. Using DFI, the implementation and execution of FI will be faster, more efficient and cheaper, and DFI will enable the sustainability of financial products provided to customers at an affordable cost (Gomber et al., 2017). Ozturk et al. (2022) investigated the interaction between digital financial inclusion, economic growth, and environmental sustainability, finding that digital financial inclusion increases economic growth; however, it has a detrimental effect on environmental quality, resulting in a rise in carbon dioxide (CO₂) emissions. Wang et al. (2022) analyse the impact of digital financial inclusion on CO₂ emissions in prefecture-level cities in China and found that digital financial inclusion leads to higher emissions in local areas and lower emissions in neighbouring cities. Their study employs a spatial econometric model to examine the impact of three dimensions of digital financial inclusion: breadth of coverage, depth of use, and technological progress—on CO₂ emissions. The results reveal a positive direct effect of digital financial inclusion on CO₂ emissions in eastern, western, and northeastern Chinese cities. Furthermore, the study finds that the mechanism mediating the effect of digital financial inclusion is primarily driven by the industrial structure and economic growth.

Empirical Studies on Insurance Penetration

Insurance penetration is a key indicator of the insurance sector's development in an economy. It is typically measured as the ratio of total insurance premiums (life and non-life) to Gross Domestic Product (GDP). Several studies have examined the determinants, trends, and impacts of insurance penetration globally. Beck and Webb (2003) explored the factors influencing insurance penetration in both life and non-life sectors. They identified economic development, income levels, financial market efficiency, legal frameworks, and demographic factors as major determinants. Enz (2000) found that insurance penetration follows an S-curve pattern, where penetration increases with economic development but at a diminishing rate. Further, Outreville (1996) and Isedomi and Chijuka (2024) highlighted that financial literacy, institutional quality, and government policies play crucial roles in determining the level of insurance penetration.

A few studies have examined the trends in Insurance penetration. For example, Swiss Re Sigma Reports (2024) provide insights into global and regional trends in insurance penetration, highlighting disparities between developed and emerging economies. These reports indicate that advanced economies have higher penetration rates, whereas developing nations face challenges with low insurance uptake. Chakraborty and Das (2020) analysed insurance penetration in emerging markets, emphasising the role of digital innovation and microinsurance in increasing coverage. Researchers also examined the effect of insurance penetration on several other issues. For example, Arena (2008) found that higher insurance penetration contributes to economic growth by enhancing financial stability and facilitating risk-sharing. Haiss and Sümegi (2008) investigated the role of insurance penetration in financial sector development and found a positive correlation between insurance growth and economic stability.

Thus, this literature review has identified key themes in the impacts of financial inclusion and digital financial inclusion on development, financial stability, economic growth, microfinancing and financial innovation, CO2 emissions, and agricultural output. Studies have also looked at the role of insurance in relation to financial inclusion, as well as the impact of financial inclusion on the performance of insurance companies.

Financial inclusion principally comprises providing financial services. Its implications on the performance of the financial service providers must thus be explored. Numerous studies have examined the impact of financial inclusion on banks. Financial inclusion is not only concerned with having a bank account, but also with accessing insurance products, postal services, and other essential services (Anusha & Rakesh, 2020). As stated earlier, insurance companies, as financial service providers, also play a crucial role in promoting the concept of financial inclusion.

Hypotheses Development

The study has used the percentage of adults with a mobile money account; the percentage of adults making digital payments; the Percentage of adults' usage of mobile phones to make utility payments; the Percentage of adults using mobile phones to receive salary; and Mobile subscriptions per 100 people as the proxies for digital financial inclusion. Thus, the hypotheses are based on these five measurements of DFI.

The dominance of mobile money in countries like Kenya, as highlighted by Lien (2015), suggests that a higher percentage of adults with a mobile money account may positively impact their participation in digital financial services. Jack and Suri (2011) argued that M-Pesa in Kenya demonstrated how mobile money enhances financial inclusion by providing unbanked populations with access to financial services, which could extend to insurance services. Furthermore, Beck and Frame (2018) found that mobile financial services, including mobile money, enhance access to microinsurance by reducing transaction costs and facilitating convenient premium payments, particularly in emerging markets. Rugemintwari and Sauviat (2023) highlighted the role of mobile money in Sub-Saharan Africa, concluding that increased mobile money adoption leads to greater participation in various financial products, including insurance, by bridging accessibility gaps. Thus, these studies collectively suggest that mobile money contributes to increased insurance penetration by providing an accessible and cost-effective platform for financial transactions. Therefore, the first hypothesis of the study is;

H1: Mobile money significantly affects insurance penetration

Digital payments have so far been the most common instrument of financial Inclusion. Digital payments enable individuals and businesses to conduct financial transactions (Sahay et al., 2020). Marc and Tommaso (2015) stated that mobile payment platforms enable their users to pay and transfer funds using mobile money, while also offering access to other financial products, such as savings or insurance. With smartphones serving as primary portals and the ability to make remote payments, an increased percentage of adults making digital payments may significantly contribute to higher participation in digital financial services. Thus, the second hypothesis of the study is;

H2: Internet payment significantly affects insurance penetration

Considering the diverse range of smartphone applications for various services, customers are increasingly comfortable using their mobile devices to pay for services, including utility payments, as outlined by Khera et al. (2021). Moreover, Donovan (2012) found that mobile financial services, including utility payments, contribute to broader financial inclusion by

familiarizing users with digital transactions, which can extend to insurance premium payments. Further, Demirgüç-Kunt et al. (2017) highlighted that digital payments, particularly mobile-based transactions, increase financial access and encourage users to adopt other financial products such as insurance, and Beck and Frame (2018) found that mobile-based financial transactions lower barriers to entry for financial products, including insurance, by simplifying premium payments and enhancing accessibility. These studies support the premise that mobile utility payments play a role in enhancing insurance penetration by fostering familiarity with digital transactions and reducing the friction associated with traditional payment methods. Thus, the third hypothesis of the study is;

H3: Mobile utility payments significantly affect insurance penetration

Digital payments have so far been the most common instrument of digital financial Inclusion. Jack and Suri (2014) found that mobile-based salary payments increase financial stability and encourage users to engage with additional financial products, including savings and insurance. Furthermore, Gelb and Clark (2013) demonstrate the role of digital wage payments in financial inclusion, concluding that receiving salaries through mobile platforms fosters trust in digital financial services, which in turn leads to greater adoption of insurance products. Munyegera and Matsumoto (2016) also examined mobile money adoption in Uganda and found that digital wage payments enhance household financial security, enabling greater participation in financial services, such as insurance. When customers have access to more resources, they can compare various insurance plans and select one that meets their needs, resulting in increased penetration. Thus, the fourth hypothesis of the study is:

H4: Receiving a mobile salary significantly affects insurance penetration

Salatin et al. (2014) suggested that mobile subscriptions have the potential to enhance the insurance industry. Given the belief that smartphones will be primary portals globally, an increase in mobile cellular subscriptions may correlate positively with higher insurance penetration. Donovan (2012) highlighted that the expansion of mobile technology, particularly mobile money, has enabled financial inclusion, including access to microinsurance in developing economies. Aker and Mbiti (2010) demonstrate that mobile connectivity enhances financial inclusion, enabling consumers to access a range of financial products, including insurance. These studies collectively support the idea that mobile connections create an enabling environment for insurance penetration by making financial products more accessible and reducing distribution costs. Thus, the final hypothesis of the study is:

H5: Mobile connection significantly affects insurance penetration

Methodology

Research Design

The research adhered to a positivist philosophy and employed a deductive research logic with a quantitative approach. The population for this study encompassed all countries worldwide. By considering the entire global landscape, the study aimed to draw comprehensive insights into the subject under investigation. The choice of a worldwide population allowed for an inclusive analysis. Due to practical constraints and data availability, a sample of 120 countries was strategically selected from the global population. The selection process was driven by the accessibility and completeness of data relevant to the study's variables. Countries were chosen to ensure representation across various regions, income levels, and developmental stages, enhancing the generalizability of the findings. The criteria for inclusion in the sample prioritized the availability of comprehensive and reliable data on key variables of interest. The

data source for this research was the World Bank Database, specifically the Financial Inclusion (Findex) Database. The World Bank Findex Database is a comprehensive repository that provides globally aggregated data on various financial inclusion indicators. The data was collected for the years 2011, 2014, 2017, and 2021 due to the availability of data. Penetration is measured as the ratio of premiums underwritten in a particular year to the gross domestic product (GDP). This measures the total premium covering life and general insurance premiums. The independent variables are access and usage of digital financial services. Access to digital financial services is measured by mobile connection, and the usage of digital financial services is assessed using Mobile money, internet payments, Mobile utility payments, and receiving mobile salaries. The variable definitions are given below.

Table 1: Operationalization of the variables

Variable	Measures	Supporting Literature/ Source
Dependent Variable		
Insurance penetration	Ratio of premium underwritten to GDP	(Holliday et al., 2021)
Independent variables		
Mobile money	Percentage of adults with a mobile account	(Obadha, 2020; Asongu, 2022)
Internet payment	Percentage of adults use the internet to pay	(Basnayake, 2024).
Mobile utility payment	Percentage of adults use mobile phones to make utility payments.	(Nsiah-Boateng 2023; Obadha, 2020)
Receive mobile salary	Percentage of adults use mobile phones to receive salary	(Nsiah-Boateng, 2023; Obadha, 2020)
Mobile connection	Mobile subscriptions per 100 people	(Asongu, 2022; Basnayake, 2024).
Control Variables		
GDP growth rate	Annual GDP growth rate	(Basnayake, 2024; Obadha, 2020)
Inflation	Annual Inflation rate	(Basnayake, 2024; Obadha, 2020)

The empirical issue is tested by using the panel regression model and the data were analysed using STATA. The panel regression was preferred because it combines both cross-sectional and time-series dimensions, allowing for better control of individual heterogeneity, improved efficiency of estimates, and more accurate analysis of dynamic changes over time compared to using cross-sectional or time-series data alone. The Modified Wald test for group-wise

heteroskedasticity is used to detect the presence of heteroskedasticity in a fixed-effects regression model. The test detects the non-constant variance of the error term; thus, the study used 'robust' standard error to correct the heteroskedasticity. Furthermore, to address the autocorrelation issue, the study employs the cluster option.

$$IP = \alpha + \beta_1 MM_{it} + \beta_2 IPay_{it} + \beta_3 MUP_{it} + \beta_4 RMS_{it} + \beta_5 MC_{it} + \beta_6 GDP_{it} + \beta_7 INF_{it} + \delta_i + \varphi_t + \varepsilon_{it} \dots (1)$$

Where $i = 1, 2, \dots, N$ denotes countries, $t = 1, 2, \dots, T$ denotes the year. δ_i and φ_t are country fixed effect and time effect, respectively and α and β are the parameters and ε_{it} is the error term. The dependent variable in equation is Insurance penetration (IP), the independent variables are; Mobile money (MM), Internet payment (IPay), Mobile utility payment (MUP), Receive mobile salary (RMS), and Mobile connection (MC), and the control variables are GDP growth rate (GDP), and inflation rate (INF).

Results and Discussion

Descriptive Analysis

Table 2 presents the descriptive statistics for the main variables of interest in this study. According to the Table, the Insurance penetration has an overall mean of approximately 1.60% with a standard deviation of 2.38. Mobile money has an overall mean of 15% with a standard deviation of 0.15, with variation ranging from 0% to 73%. The data analysis of internet payments reveals that, on average, approximately 50% of individuals aged 15 and above have engaged in digital payment transactions, with a standard deviation of 0.30. However, this statistic is characterized by considerable variation, with percentages ranging from as low as 2% to a maximum of 99%. Similarly, the Mobile utility payment data show that, on average, around 9% of individuals in the 15+ age group use mobile phones for utility payments, with a standard deviation of 0.10. Once again, there is notable variability, with percentages ranging from 0% to 49%. The analysis of receiving mobile salary indicates that, on average, approximately 2% of individuals aged 15 and above receive their wages through a mobile phone with a standard deviation of 0.02. This percentage exhibits limited variation, with values ranging from 0% to a maximum of 9%. In contrast, the Mobile connection represents a different aspect of mobile technology. On average, there are approximately 110.80 mobile cellular subscriptions per 100 people, with a standard deviation of 29.36. This statistic exhibits moderate variation, with values ranging from 50.15 to 162.08 subscriptions per 100 people. The average GDP growth over the period is 4.4%, whereas the inflation was reported at a mean value of 6.5%. The data winsorized at the 5th and 95th percentiles to mitigate the impact of outliers.

Table 2: Descriptive statistics

Variable	Mean	Std. Dev	Min	Max
Insurance Penetration (IP)	1.5975	2.3856	.00058	19.3953
Mobile money (MM)	0.1463	0.1579	0.000	0.72931
Internet payment (IPay)	0.4984	0.3077	0.0201	0.99934
Mobile utility payment (MUP)	0.0879	0.1023	0.000	0.48775
Receive mobile salary (RMS)	0.0178	0.0243	0.000	0.08631
Mobile connection (MC)	110.8012	29.3636	50.1475	162.076
GDP Growth rate (GDP)	4.4919	3.3700	-12.0163	17.2907

Inflation (INF)	6.5248	10.3896	-11.8763	150.0007
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Note: Table 2 presents the mean, standard deviation, minimum, and maximum values of the full sample over the period of 2011, 2014, 2017, and 2021.

Correlation Analysis

The correlation test results show the correlations between study variables and the p-values associated with these correlations.

Table 3: Correlation matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) IP	1.000							
(2) MM	0.106	1.000						
(3) IPay	0.488***	0.621***	1.000					
(4) MUP	0.176***	0.761***	0.647***	1.000				
(5) RMS	0.013	0.761***	0.167***	0.300***	1.000			
(6) MC	0.409***	0.058	0.377***	0.198***	0.080	1.000		
(7) GDP	-0.090*	-0.024	-0.033	0.187***	-0.044	-0.032	1.000	
(8) INF	-0.203***	0.110	-0.129**	0.032	0.057	-0.103**	-0.074	1.000

Note: ***, **, and * indicate the coefficients that are statistically significant at the 1%, 5%, and 10% levels, respectively.

Based on these results, insurance penetration (IP) is significantly and positively correlated with internet payment (IPay), mobile utility payment (MUP), and mobile connection (MC). Similarly, mobile money (MM) exhibits a positive and significant correlation with IPay, MUP, and RMS. Furthermore, IPay is positively and significantly correlated with MUP, RMS, and MC, while its correlation with inflation is negative and significant. MUP also shows a positive and significant relationship with RMS, MC, and GDP. Lastly, MC is negatively and significantly correlated with inflation.

4.5. Regression results

Table 4: Effect of Digital financial inclusion on Insurance penetration

	Coef.	St. Err.	t-value	p-value
MM	0.761*	0.452	1.68	0.094
IPay	0.744**	0.373	2.00	0.047
MUP	0.749	0.627	1.19	0.234
RMS	-0.629	1.344	-0.47	0.640
MC	0.001	0.002	0.86	0.393
Constant	0.900***	0.163	5.51	0.000
Controls	Yes			
Firm-fixed effect	Yes			
Time-fixed effect	Yes			
Mean dependent var	0.943	SD dependent var	1.632	
R-squared	0.051	Number of obs	248	
F-test	1.308	Prob > F	0.078	
Akaike crit. (AIC)	61.689	BIC	89.796	

Note: ***, **, and * indicate the coefficients that are statistically significant at the 1%, 5%, and 10% levels, respectively.

The study aims to explore the impact of DFI on Insurance penetration. The results of the panel fixed effect model are presented in Table 4¹. The overall model is statistically significant at the 10% level, suggesting that the set of independent variables collectively explains a significant portion of the variation in insurance penetration. The coefficient of mobile money (MM) is 0.761, with a p-value of 0.094. The effect of MM is significant in predicting the insurance penetration. The coefficient of Internet payment (IPay) is 0.744 with a p-value of 0.047, suggesting a significant impact in predicting insurance penetration. The coefficient of mobile utility payment (MUP) is 0.749, with a p-value of 0.234, indicating an insignificant effect on predicting insurance penetration. Received mobile salary and mobile connection are both statistically insignificant, implying no strong relationship with insurance penetration. The model includes firm-fixed effects and time-fixed effects, controlling for unobserved heterogeneity. The R-squared value (0.051) indicates low explanatory power, meaning that the independent variables account for only 5.1% of the variation in the dependent variable. The F-test indicates that the overall model is statistically significant at the 10% level.

In examining the impact of various financial inclusion factors on insurance penetration, the coefficients of key variables provide insight into their significance. Expanding our perspective beyond the scope of mobile money, this study recognizes that digital financial services comprise a diverse environment. Although the investigation primarily centres on mobile money, it's crucial to acknowledge its varying occurrence across different regions. Notably, countries like Kenya have witnessed the dominant influence of mobile money, as highlighted by Lien et al. (2015). Despite the positive relationship indicated by the coefficient (0.761) for Mobile money, the accompanying p-value (0.094) suggests a low level of statistical significance. This emphasises its impact as universally significant across diverse settings. The study confirms the findings of Marc and Tommaso (2015) on the mobile payment platforms and their impact on insurance. The dynamic landscape of digital financial services has witnessed remarkable transformations, catalysed by the rapid expansion of mobile money service providers, as articulated by Khera et al. (2021). This surge has not only facilitated increased transactions but has also enhanced accessibility to financial services through mobile phones and the Internet. Sahay et al. (2020) emphasize the pervasive impact of digital payments, showing them as a prevailing instrument of financial inclusion that empowers both individuals and businesses to engage in diverse financial services. In accordance with this, Khera et al. (2021) highlight how mobile money service providers are evolving, extending their offerings beyond transactions to include credit and insurance services in various countries. The pivotal role of digital payments in influencing life insurance premium volume becomes evident when examining the highly significant positive coefficient of 0.744 for Digital payments. This underscores the transformative impact of digital payment mechanisms, aligning with Sahay et al.'s (2020) assertion that digital payments play a central role in financial inclusion.

On another note, receiving wages through a Mobile presents a unique scenario. Despite its non-significant p-value (-0.629), the negative coefficient implies a potential impact on life insurance penetration. This finding encourages us to examine more closely how using mobile phones for receiving wages may subtly influence insurance trends. Essentially, these results underscore that digital financial services, such as using mobile phones for various transactions, have both advantages and disadvantages, highlighting the complexities of their relationship to life insurance involvement.

¹ The authors have conducted the preliminary tests of the panel regression, and the fixed effect model is suggested from the Hausman test.

Salatin et al., (2014) research highlighted the transformative potential of mobile user subscriptions in enhancing the productivity of the insurance industry, particularly in selected countries. Their findings underscore the strategic role of mobile subscriptions in shaping the insurance landscape's dynamics. Building on this insight, analysis of Mobile Cellular Subscriptions reveals a positive coefficient of 0.001 but an insignificant impact. These results contradicted those of Salatin et al. (2014), who suggested that the proliferation of mobile subscriptions can be a catalyst for increased engagement with insurance services. However, as Lien (2015) suggests, a higher percentage of adults with a mobile money account may positively impact their participation in digital financial services.

Conclusion

This study examines the intricate relationship between digital financial inclusion and insurance penetration, drawing on an in-depth analysis of relevant variables and existing literature. Notably, the growth of mobile money service providers, as emphasized by Khera et al. (2021), has substantially enhanced financial transactions and access through mobile phones and the internet. The study corroborates this trend, particularly highlighting the influential role of digital payments in augmenting life insurance premium volume.

Sahay et al. (2020) highlighted the prevalence of digital payments as a common means of financial inclusion, enabling individuals and firms to access various financial services. The statistically significant positive coefficient (0.744) for the percentage of adults making digital payments reinforces the importance of this mode of financial transaction in influencing insurance penetration positively. However, the results are complicated, and challenges emerge, as highlighted by Lien et al. (2015) and Khera et al. (2021). This study's notable result is the positive association with the percentage of adults using internet to make payments. This suggests that while digital payments have a positive impact on life insurance penetration. Mobile payment platforms, as noted by Marc and Tommaso (2015), expand beyond facilitating transactions to offer various financial products, including savings and insurance. The study aligns with this perspective, emphasizing the potential for mobile payment systems to stimulate innovation in financial services. As the mobile-based wage transaction indicates, there is a need for further exploration into the subtle dynamics influencing insurance within this context.

Overall, the study aligns with the perspective that smartphones, acting as primary portals for financial transactions, offer opportunities for governments to adopt government-to-person payments and for individuals to access various services, as highlighted by Lien et al. (2015). The amalgamation of these findings emphasizes the complex nature of digital financial services, indicating both opportunities and challenges in their relationship with insurance penetration. Future research endeavors may benefit from the exploration of the evolving digital financial landscape and its interactions with insurance dynamics.

In conclusion, the study confirms the transformative impact of digital financial services on insurance dynamics. While digital payments emerge as a key driver of increased insurance penetration, challenges highlight the need for a clear understanding of the evolving digital transformation. The study aligns with literature emphasizing the nature of digital financial services and the relationship between insurance penetration.

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